

**WHAT IS CLAIMED IS:**

1. A process for cleaning a deposition chamber having multiple substrate stations contained therein, comprising:

a first cleaning step that includes maintaining a deposition chamber at a first pressure while passing a fluorocarbon gas into said deposition chamber, said first cleaning step conducted until an endpoint is reached;

a second cleaning step that includes maintaining said deposition chamber at a second pressure while passing said fluorocarbon gas into said deposition chamber; and

a third cleaning step that includes maintaining said deposition chamber at a third pressure less than said first and second pressures while passing said fluorocarbon gas into said deposition chamber.

2. The process as recited in Claim 1, wherein said fluorocarbon gas is selected from the group consisting of:

octofluoropentane ( $C_3F_8$ );

octofluorocyclobutane ( $C_4F_8$ ); and

octafluorotetrahydrofuran ( $C_4F_8O$ ).

3. The process as recited in Claim 1, wherein said

2 endpoint is determined by monitoring optical emissions from  
3 fluorine and carbon monoxide.

4. The process as recited in Claim 1, wherein a duration  
2 of said second cleaning step is substantially less than a  
3 duration of said first cleaning step and a duration of said third  
4 cleaning step is a function of said duration of said first  
5 cleaning step.

5. The process as recited in Claim 1, wherein said second  
2 pressure is greater than said first pressure.

6. The process as recited in Claim 1, wherein said first  
2 and second cleaning step further include passing said  
3 fluorocarbon gas into said deposition chamber at substantially  
4 equal flow rates of between about 600 and about 1200 sccm, and  
5 said third cleaning step further includes passing said  
6 fluorocarbon gas into said deposition chamber at a third flow  
7 rate of between about 300 and about 1200 sccm.

7. The process as recited in Claim 1, wherein said first  
2 cleaning step is performed before said second cleaning step, and  
3 said third cleaning step is performed after said second cleaning

4 step.

8. The process as recited in Claim 1 wherein said  
2 deposition chamber includes a controller configured to conduct a  
3 two-step cleaning process and said controller is modified to  
4 provide a three-step cleaning process controller and said process  
5 further includes implementing said three-step cleaning process  
6 controller to conduct said first, second and third cleaning  
7 steps.

9. A system for cleaning a deposition chamber having multiple substrate stations contained therein, comprising:

- a detector configured to monitor cleaning by-products in a deposition chamber; and
- a controller configured to provide at least three cleaning steps and to initiate a transition from one to another of said cleaning steps in response to a signal from said detector, said at least three cleaning steps comprising:
  - a first cleaning step that includes maintaining a deposition chamber at a first pressure while passing a fluorocarbon gas into said deposition chamber, said first cleaning step conducted until an endpoint is reached;
  - a second cleaning step that includes maintaining said deposition chamber at a second pressure while passing said fluorocarbon gas into said deposition chamber; and
  - a third cleaning step that includes maintaining said deposition chamber at a third pressure less than said first and second pressures while passing said fluorocarbon gas into said deposition chamber.

10. The system as recited in Claim 9, wherein said second pressure is greater than said first pressure.

11. The system as recited in Claim 9, wherein said detector  
2 indicates that said cleaning by-products change by a predefined  
3 amount.

12. The system as recited in Claim 9, wherein said detector  
2 includes an optical spectrometer configured to measure optical  
3 emissions from by-products produced from a reaction between said  
4 deposits and said fluorocarbon gas.

13. The system as recited in Claim 9 wherein said  
2 controller is configured to conduct a two-step cleaning process  
3 and said controller is modified to provide a three-step cleaning  
4 process controller, wherein said three-step cleaning process  
5 controller is configured to implement said three-step cleaning  
6 process controller to conduct said first, second and third  
7 cleaning steps.

14. The system as recited in Claim 9, wherein said  
2 controller includes one or more valves for introducing  
3 fluorocarbon gases into said deposition chamber.

15. The system as recited in Claim 9, wherein said  
2 controller further includes:  
3 a computer configured to read a data file having settings

4     for said at least three cleaning steps; and  
5             a computer readable media capable of causing said computer  
6     to produce said signal to initiate said transition.

16. A method of manufacturing semiconductor devices

comprising:

transferring a plurality of substrates into a deposition chamber having multiple substrate stations contained therein and depositing material layers on said substrates; and

cleaning said deposition chamber using an *in situ* cleaning process when deposits in said deposition chamber reaches a predefined thickness, said *in situ* cleaning process comprising:

a first cleaning step that includes maintaining said deposition chamber at a first pressure while passing a fluorocarbon gas into said deposition chamber, said first cleaning step conducted until an endpoint is reached;

a second cleaning step that includes maintaining said deposition chamber at a second pressure while passing said fluorocarbon gas into said deposition chamber; and

a third cleaning step that includes maintaining said deposition chamber at a third pressure less than said first and second pressures while passing said fluorocarbon gas into said deposition chamber.

17. The method recited in claim 16, wherein said predefined thickness is estimated from a rate of depositing said material layers on said substrates.

18. The method recited in claim 16, further includes  
2 performing a wipe-cleaning-out of said deposition chamber when a  
3 variation in thickness of said material layer exceeds a  
4 predefined limit.

19. The method recited in claim 18, wherein said  
2 predefined limit is about  $\pm 5$  percent of a target thickness.

20. The method recited in claim 18, wherein a period until  
2 said wipe-clean-out process is at least about 50 deposition  
3 hours.